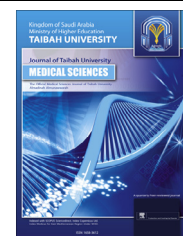




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Clinical Study

Anatomical study of the mesiobuccal root in maxillary first molars

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المخلص

أهداف البحث: يهدف هذا البحث إلى دراسة الشكل التشريحي للجزء الأنسي الشدقي في أول الأضراس العلوي لدى سكان المنطقة الشمالية من سورية.

طرق البحث: شملت عينة البحث خمسة وتسعين ضرساً أولياً علوياً دائمة، حيث تم توضيح وصيغ هذه الأسنان. بعد ذلك تم دراسة الأضراس من حيث عدد ونمط الأقنية الموجودة في الجزء الأنسي الشدقي.

النتائج: أظهرت نتائج الدراسة أنه من أصل 95 ضرساً درست؛ احتوى 38 (40%) ضرساً في جذره الأنسي الشدقي على قناتين، في حين احتوى 57 (60%) ضرساً على قناة واحدة في جذره الأنسي الشدقي.

الاستنتاجات: عندما يقوم الطبيب الممارس بمعالجة ضرس أولي علوي عليه أن يتوقع وجود قناتين في الجزء الأنسي الشدقي حتى يثبت العكس، بوجود قناة واحدة فقط.

الكلمات المفتاحية: تشعب الجذور؛ الضرس الأول العلوي؛ الجزء الأنسي الشدقي؛ شكل الجذر

Abstract

Objective: The aim of this study was to investigate the morphology of the mesiobuccal root of the maxillary first molar.

Methods: Ninety-five permanent maxillary first molars were collected, stained and cleared, and the number and

type of root canals were determined in the mesiobuccal root of each cleared tooth.

Results: Two canals were found in the mesiobuccal root of 38 (40%) of the 95 permanent maxillary first molars and a single root in 57 (60%).

Conclusion: When performing endodontic therapy on maxillary first molars, the clinician should always assume that there are two canals in the mesiobuccal root until it is proven that there is only one.

Keywords: Anatomy; Cleared tooth; Configuration; Maxillary first molar; Mesiobuccal root; Morphology

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Introduction

Successful root-canal treatment depends on adequate cleaning, shaping and filling of the root canal system. In order to achieve this, it is imperative that the operator has detailed knowledge of the root-canal morphology of each tooth being treated.¹ Slowey² stated that the root canal anatomy of teeth has certain common characteristics and numerous atypical ones, which

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can indicate the actions necessary for successful endodontics. Root canal anatomy dictates the location of initial access and the size of the first files to be used and indicates a rational approach to solving any problems that arise during therapy. Maxillary first molars are the most frequently endodontically treated teeth in the permanent dentition. The problems arising during endodontic treatment of permanent maxillary molars indicate that more knowledge is required of the anatomy of root canal systems.

The mesiobuccal root of maxillary first molars has prompted more research and clinical investigations than any other tooth in the mouth.³ Treatment of these molars has a high failure rate,^{4,5} and Smadi and Khraisat⁴ reported that this is often due to the presence of a second canal in the mesiobuccal root that the clinician fails to detect, débride and obturate. It is imperative for a dentist performing endodontic therapy on maxillary first molars to examine carefully the pulpal floor to locate the orifices of any "extra" canals, especially the second mesiobuccal canal.⁶ The incidence of a second mesiobuccal canal has been reported to range from 40% to 95%⁶; Weine et al.⁷ showed that 48.5% of maxillary first molars had a single canal, 37.5% had two canals that merged towards a single apical foramen and 14.0% had two distinct canals with separate apical foramina. Pineda [8] reported that 59.2% of mesiobuccal roots in maxillary first molars had two canals. Fogel et al.³ found that the frequency of two mesiobuccal roots in maxillary first molars was 71.2%; of these, 31.7% had two apical foramina and 39.4% had two canals that joined. Weller et al.⁹ reported that 60% of mesiobuccal roots in maxillary first molars had two canals.

The mesiobuccal root of maxillary first molars has been studied in many populations and countries. In China, Weng et al.¹⁰ reported that the prevalence of mesiobuccal roots with a single root canal extending from the pulp chamber to the apex in maxillary first molars was 66.7%. Other investigators have reported the prevalence of maxillary first molars with four canals in whites to be 28–62%.¹¹ Shahi et al.¹² noted two mesiobuccal roots in maxillary first molars in 62.4% of cases in an Iranian population. In India, Neelakantan et al.¹³ found that the commonest canal morphology in the mesiobuccal root of three-rooted first molars was a single root canal extending from the pulp chamber to the apex (51.8%).

The aim of the study reported here was to investigate the anatomical morphology of the mesiobuccal root of maxillary first molars in a population in northern Syria.

Materials and Methods

Ninety-five permanent maxillary first molars were collected from dental faculty clinics and private offices in northern Syria. The teeth included in this study had intact clinical crowns and fully developed apices. The age and sex of the patients and the reason for extraction were not recorded.

Any adherent soft tissue, bone fragment or calculus was removed by scaling and polishing. Access cavities were prepared with a high-speed hand-piece and diamond fissure burs (Komet, Gebr. Brassler GmbH, Germany). After location of the orifices, pulp tissue was dissolved by immersing the teeth in 5.25% sodium hypochlorite for 12 h. Then, the teeth were washed under running tap-water for 2 h and dried overnight. India ink was injected into the pulp chamber with a syringe with

a 27-G needle, and excess ink was removed from the surface of the tooth with gauze soaked in alcohol. The stained teeth were air-dried and decalcified with 5% hydrochloric acid for 3 days, the acid solution being changed daily. The teeth were again washed under running tap-water overnight and air-dried. The specimens were then dehydrated in ascending concentrations of ethanol (75%, 85%, 96% and 100%) for 4 h each, and transparent specimens were obtained by immersing the dehydrated teeth in methyl salicylate solution, in which the teeth were stored until they were examined (Figures 1 and 2).

The cleared teeth were examined under a magnifying glass, and the root canal systems were classified according to Vertucci,¹⁴ as follows:

Type I: a single root canal extending from the pulp chamber to the apex;

Type II: separate root canals leaving the pulp chamber and joining short of the apex to form one canal;

Type III: one root canal leaving the pulp chamber before dividing into two canals within the root and then merging to exit as a single canal;

Type IV: two separate root canals extending from the pulp chamber to the apex;

Type V: one root canal leaving the pulp chamber and dividing short of the apex into two separate and distinct root canals with separate apical foramina;

Type VI: two separate root canals leaving the pulp chamber, merging in the body of the root and again dividing short of the root apex to exit as two separate and distinct canals;

Type VII: one root canal leaving the pulp chamber, dividing and re-joining within the body of the root canal and finally re-dividing into two distinct canals short of the apex and

Type VIII: three separate and distinct root canals extending from the pulp chamber to the apex.

Results

Of the 95 maxillary first molars studied, 57 (60%) had a single canal (type I) in the mesiobuccal root, and 38 (40%) had two canals. In the molars with two canals, the type II configuration was most prevalent (27; 71.0%), followed by type IV (9; 23.7%) and type V (2; 5.3%).



Figure 1: Type I canal configuration.



Figure 2: Type II canal configuration.

Discussion

In this study, 40% of the maxillary first molars had two canals. This rate is lower than that reported in most previous studies^{7–9,12} but similar to that reported by Weng et al.¹⁰. We found a high prevalence of type II configuration (71.05%), in contrast to the reports of Weine et al.^[7] and Fogel et al.³. The wide variation in the frequency of two mesiobuccal roots canals (40–95%) may be related to the methods used for determining additional canals. For instance, two mesiobuccal root canals were identified significantly less frequently in clinical studies than in vitro.¹⁵ Baldassari-Cruz et al.¹⁶ found that the number of located second mesiobuccal canals increased from 51% with the naked eye to 82% under a dental operating microscope. In another study, 41.3% of second mesiobuccal canals were identified under a magnifying glass and 93.7% under a dental operating microscope.¹⁷ In a study by Imura et al.¹⁸ graduate students found two mesiobuccal root canals in 52% of extracted maxillary first molar teeth, while the incidence of two mesiobuccal roots rose to 81% after the same root was made transparent, as in our study.

The wide variation in the rates of two canals in the mesiobuccal root of maxillary first molars revealed may also be due to racial or ethnic differences. Therefore, further studies in different parts of the world are needed.

Conclusion

When performing endodontic therapy on maxillary first molars, the clinician should always assume that there are two canals in the mesiobuccal root, until proven differently. In many cases, the dental operating microscope is useful for detecting two mesiobuccal root canals in maxillary first molars.

Conflict of interest

None declared.

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